ALTERNATIVE MORTGAGE INSTRUMENTS IN HIGH-INFLATION ECONOMIES

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EXECUTIVE SUMMARY

Inflationary environments present a large challenge for systems of housing finance because of the difficulty of protecting the real value of lenders' resources outstanding and providing an adequate return, while ensuring continued access to credit for borrowers on terms which make financing affordable.

In particular, this paper looks at the potential for using alternative mortgage instrument designs for addressing these problems. It outlines the problems which inflation causes in a traditional system of housing finance (based on fixed-term, fixed-rate loans) and the drawbacks associated with using subsidized credit as a means of resolving these problems. The standard forms of the various alternative instruments available—price level adjusted mortgages (PLAMs), adjustable rate mortgages (ARMs), and dual index mortgages (DIMs)—are described and their theoretical advantages and problems are explored. The characteristics of the various mortgage instruments are illustrated by simulating their application in the Turkish economy during 1970-1990.

The final section presents an assessment of the key elements determining the success or failure of housing finance systems using alternative mortgage instruments. The importance of these factors is highlighted through a series of brief case studies of the experience of different countries in their use of these alternative instruments. The case studies outline the considerations which led to the adoption of these loan products, the features of the instruments which differed from the standard model, and the results and key issues arising from the use of the alternative system.

The country case studies show that the usefulness and sustainability of housing finance systems based on alternative instruments depend not only on the characteristics of the loan products used, but also on the correct set of supporting actions and policies by government and financial institutions. Some of the lessons about government policy are:

- The public sector plays a strong role in mobilizing funds for housing finance.
- Government carries a large share of the repayment risk associated with unforeseen changes in economic conditions.
- Economic policy must be consistent and credible to attract private participants.
- The system of indexation cannot be constantly adjusted to provide relief without eventually destabilizing the system.

ALTERNATIVE MORTGAGE INSTRUMENTS IN HIGH-INFLATION ECONOMIES

Introduction

One of the key problems facing countries with high levels of inflation is how to continue to provide affordable housing to their populations. The problem of housing affordability has two aspects. The first ("income affordability") relates to the absolute level of resources households can supply to purchase housing. This is not a difficulty of housing finance as much as a problem of income levels and housing costs. Solutions for very poor households experiencing this kind of affordability problems are likely to be found through improvements in the households' earning capacity, more efficient housing delivery systems, and more affordable standards of housing construction.

The second aspect of affordability ("financial affordability") concerns the effect of inflation on the costs of borrowing. Inflationary environments present a large challenge for systems of housing finance because of the difficulty of protecting two disparate sets of interests:

- Protection of the real value of lenders' resources outstanding and providing an adequate return
 to ensure a continued flow of funds into the housing finance system.
- Continued access to credit for borrowers on terms which make financing affordable.

It is the solution to these problems, which would allow financing for housing to be affordable to a wider range of households desiring to purchase a home, that is the focus of this paper.

In particular, this paper looks at the potential for using alternative mortgage instrument designs for addressing the financial affordability issues outlined above. The following section outlines the problems which inflation causes in a traditional system of housing finance (based on fixed-term, fixed-rate loans) and the drawbacks associated with using subsidized credit as a means of resolving these problems. The third section describes standard forms of the various alternative instruments available and their theoretical advantages and problems. Within these two sections, the characteristics of the various mortgage instruments are illustrated by simulating their application in the Turkish economy during 1970-1990. Figure 1 shows the volatility of annual movements of prices, nominal wages, and real wages in Turkey during this period.

The final section presents an assessment of the key elements determining the success or failure of housing finance systems using alternative mortgage instruments. The importance of these factors is highlighted through a series of brief case studies of the experience of different countries in their use of

these alternative instruments. The case studies outline the considerations which led to the adoption of these loan products, the features of the instruments which differed from the standard model, and the results and key issues arising from the use of the alternative system.

Defining the Problem and Approaches to Solutions

The "standard" mortgage instrument used by many lenders for housing is the fully amortizing, constant payment mortgage. This loan uses a repayment pattern of constant, regular payments calculated from the original loan amount at a fixed rate of interest for a given term. This structure allows the original loan amount to be completely repaid at the end of the term, with the lender having earned a fixed rate of interest on the outstanding loan balance throughout the loan term.

Experience in economies undergoing high rates of inflation have highlighted the problems that this standard instrument can cause for both borrowers and lenders. With high inflation, lenders are forced to charge a high nominal interest rate on the loan in order to maintain a positive real rate of return on their investment. This high nominal interest rate leads to high initial payments under a fixed-rate, fixed-term loan. However, as time passes the real value of the loan payment (which is constant in nominal terms) is eroded by the continuing inflation. This decline in the real value of the payment over the term of the loan is known as the "tilt" problem: the real repayment of the loan is "tilted" towards the early part of the loan term.

This tilting of repayments has a modest positive effect for the lender (in that he receives higher real

repayments in the early years of the loan term). The effects of the tilt on the borrower are much more substantial. The higher nominal interest rate required to overcome the expected effects of inflation raises the payment; this increase in the payment level must be met out of the household's current real income. Over time, of course, as nominal household income rises with inflation, the required payment becomes more and more easily affordable. However, the high real value of the initial payment under inflation implies that households will have greater

The simple case outlined here assumes that inflation is constant or that the lender is able to perfectly forecast future inflation.

difficulty qualifying as borrowers. Given that the tilt effect increases as inflation increases, it is clear that higher levels of inflation make it increasingly difficult for households to qualify for loans based on their current income.

The case of Turkey during 1970-1990 provides an example of an economy experiencing price movements which are both high and volatile (see Table 1). Inflation accelerated through the 1970s, exceeding 100 percent in 1980. Wages, for the most part, rose even faster during the decade. In the 1980s, inflation has been cut back, but still has not been brought under tight control. Despite the slowing of inflation, wages have grown even more slowly, pushing down real wages.

Under these inflationary conditions, the relations between the rising price level and fixed nominal
payments of a standard fixed-rate mortgage can easily be seen. Table 2 shows the repayment schedule for
a household which obtained a mortgage loan of TL 26,249 in 1970 with an annual interest rate of 11

percent and a term of 15 years.² The effect of rising nominal prices and wages is that the share of income which the household has to devote to servicing its housing debt falls rapidly: by the fifth year, debt service requires only half the share of household income as in the first year of the loan; by the tenth year, less than 1 percent of household income is required to service the loan.

Two main approaches that have been tried in a number of countries to address this repayment tilt problem: (1) to provide direct subsidies in order to reduce the burden on households of servicing their mortgage debt; and (2) to structure lending instruments in a manner which addresses the concerns raised above.

The most common form of subsidy system has been that of subsidized interest rates whereby the cost of borrowing for housing is less than that of other forms of

The loan amount in these simulations is the maximum amount which a household could borrow by spending only 25 percent of household income on servicing the loan. The loan-to-value ratio shown in the table is based on the cost of a 62 square metre, 2-bedroom flat in a 5-storey building designed by the Ministry of Resettlement and Construction for low-income households; the data is from the SIS. Note that the simulations present repayment schedules based on annual payments and adjustments. This approach was required due to the limits of the data series, which provide only annual figures.

credit. Buckley et al. (1989) identify four major problems with this approach:

• Subsidized credit for housing allows households to use their own savings to finance other consumption, effectively reducing the efficiency of the subsidy directed towards housing.

- Below-market rate credit in economic environments with high annual inflation is aimed at affordability problems which can be solved through indexed mortgage instruments.
- Interest rate subsidies do not really deal with the repayment tilt problem which affects the borrower in the early years of the loan, but reduces the real value of repayments throughout the life of the loan.
- Aggregate levels of credit subsidies needed to overcome the effects of inflation in most countries experiencing inflation-related affordability problems would be enormous and unsustainable.

Given these difficulties and the tight public sector budgetary situations which often exist in inflationary environments, use of alternative mortgage instruments is an attractive option. Not only may they provide a means of making borrowing for housing more affordable to households, but they can also help to reduce and better distribute the risk associated with lending between lenders and borrowers without the need for extensive support from the state budget.

The distribution of risk is extremely important when inflation is high *and* volatile. The simple examination of the tilt problem above was based on perfect knowledge about future inflation. In practice, lenders must make imperfect estimates of future inflation. Wrong forecasts by lenders of future inflation can significantly shift costs between lenders and borrowers—higher costs onto borrowers if inflation is less than expected, onto lenders if inflation is higher than expected.

The problems caused by not correctly forecasting inflation can also be seen in the fixed rate mortgage in Table 2. The mortgage rate, which is based on a 2 percentage point spread over the bank discount rate, in 1970 was set at 11 percent. Though this was modestly positive in real terms—inflation was about 8 percent in 1970—the real rate was highly negative from 1971 onwards. As a result, total real repayments to the lender (in constant 1970 TL) were less than the original amount of the mortgage; the real rate of return to the lender was negative.³ Obviously, this is not a satisfactory outcome for the lender.

However, to the extent that the lender attempts to compensate for this risk by making high estimates of future inflation, the less affordable the loan becomes for the borrower.

In addition to the problem of forecasting future inflation, lenders must also make predictions about the future real cost of funds to finance their mortgages. If it is possible to perfectly match the terms of the liabilities that fund the loans, then this is not a problem—the real cost of these funds is fixed and known. However, it is more often the case that the terms of the lenders' liabilities do not match exactly with the terms of the lenders' outstanding loans. Just as with forecasts of inflation, if the lender overestimates the future real cost of funds, a windfall gain results. But if the lender underestimates the future real cost of funds, significant losses can quickly mount. Though the volatility of the real cost of funds is usually much less than changes in the rate of inflation, this risk is significant and it may be beneficial to spread the risk between the borrower and lender.

The following section looks at the various alternative loan products available and their features that address the repayment tilt and risk distribution problems.

Alternative Mortgage Instruments

The alternative mortgage instruments described in this section differ from the fixed-rate mortgage described above in that they provide for variable interest rates and payment schedules that vary with changing economic conditions. This variability allows lenders and borrowers to share the risks associated with changing inflation and interest rates—allowing a better matching of loan structures with lenders' resource costs, thus lowering the financing costs of borrowers.

Price Level Adjusted Mortgage

One approach to resolving the problems described above is to explicitly incorporate changes in the price level into the design of the mortgage. Such price level adjusted mortgages (PLAMs) utilize an interest rate which reflects only the real cost of funds and the repayment risk associated with the mortgage loan. Initial payments are calculated based on this interest rate and the outstanding balance of the loan. The outstanding balance of the loan is then periodically revalued (in nominal terms) according to a price

^{(...}continued)

extent that the cost of funds is positive—for example, the interest which banks must pay to depositors to attract their deposits—the rate of return to the investor is lower. Thus, in the case shown in Table 2, if the real cost of funds to the lender were five percent annually, the real rate of return to the lender would be -16.4 percent annually.

index. The result of this approach is to shift the risk of future inflation onto the borrower, while leaving the risk associated with the real interest rate entirely with the lender.

In a typical PLAM, the payments for the first year of the loan are based on an amortization schedule for the full term of the loan at the contracted interest rate. At the end of the first year, the outstanding balance is adjusted by the change in specified price index (for example, the consumer price index, or CPI). A new payment is calculated based on amortization of the revalued nominal balance over the remaining term of the loan at the contracted interest rate. This process is repeated at the end of each year of the loan until the loan is fully amortized. High-inflation countries adopting the PLAM include C o l o m b i a, I s r a e l, I t a l y, a n d A u s t r a l i a.

Table 3 shows the repayment schedule of a 15-year PLAM originated in Turkey	in 1970.
Payments are calculated as described above, with amortization based on an interest rate of 4 pe	rcent. At

the end of each year, the nominal outstanding loan balance is adjusted by the CPI.4

The table shows some of the key features of the PLAM:

Because of data limitations, payments and inflation adjustments are made annually in this and the following simulations. The payment schedule is calculated using actual inflation for the current year rather than figures lagged one year. This method was used in order to present figures which reflect the more accurate results achieved in practice with monthly payments and more frequent adjustments to the outstanding balance (monthly or quarterly). However, it is the case that distortions caused by reliance on *ex post* measures of inflation can cause significant losses for lenders if the rate of inflation is high and accelerating.

• The real value of payments is held constant through the term of the loan. This leveling of the tilt problem increases the affordability of the loan to the borrower. With the same income of TL 14,601 the household is now able to borrow TL 40,585. This is 55 percent more than could be borrowed with a standard fixed-rate mortgage; the loan-to-value ratio rises from 44 percent under the fixed rate mortgage to 68 percent under the PLAM.

- The share of income devoted to servicing the mortgage shows wide variations, moving in opposition to the trend in real wages. In the case shown, this is not a problem as the payment to income ratio remains below the initial 25 percent. However, a household which took up a PLAM in 1976 based on a payment equal to 25 percent of income would be required to pay 40 percent of their income to service the mortgage in 1988 because of declining real wages (see Table 4 on the previous page).
- In nominal terms, the outstanding loan balance increases through the first 13 years of the loan (although the balance is actually declining continually in real terms). This requires that lenders have access to additional resources to finance this negative nominal amortization.⁵ In addition, in cases where the CPI outpaces the nominal increase in housing property values, borrowers have increased incentive to default, raising the risk faced by lenders.

Adjustable Rate Mortgage

The PLAM shifts the risk associated with inflation onto the borrower while leaving the cost of funds risk with the lender. Adjustable rate mortgages (ARMs), which use indexes based on interest rates rather than the price level, allow lenders to shift the risk associated with changes in real interest rates onto borrowers as well. By using current interest rates at the end of period to alter the mortgage rate, lenders can frequently adjust their expected return to reflect up-to-date information about expected inflation and the real cost of funds, as well as using the adjustment process to re-evaluate other risk factors such as borrower incomes and property values. Because lenders bear less risk with an ARM, it should be the case that the initial interest rate should be lower than the interest rate on an equivalent fixed rate mortgage.⁶ Obviously, ARMs should be avoided in countries where monetary authorities set interest rates on

The use of indexation to maintain the real value of the outstanding balance (and payments) also allows lenders the opportunity to use indexed liabilities (which closely match the indexed loan assets) to raise funds. Such indexed instruments are more attractive to long-term investors in inflationary environments than products which offer fixed rates of return.

There are usually some limits on the risk which borrowers are required to assume. These limits usually take the form of caps on the annual increase and total increase of the mortgage rate. For example, a standard ARM product in the United States limits interest rate adjustments to 2 percentage points in one year and 6 percentage points (from the starting rate) over the life of the loan. If the rate implied by the index exceeds these caps, the excess portion of the payment is usually capitalized into the outstanding balance.

mortgages or the liabilities that finances them.

An ARM begins with the initial interest rate used to calculate payments based on complete amortization at that rate over the full term of the loan. If the ARM is adjusted annually, at the end of the first year, the mortgage interest rate is adjusted based on the chosen interest rate index. A new payment schedule for the second year is calculated based on amortization over the term less one year. At the end of each year, this process is repeated until the loan is paid off in the final year of the term. ARMs are widely used in countries with moderate inflation; these include the United States and Canada in North America and the United Kingdom, Italy, and others in Western Europe.

Table 5 shows a repayment schedule for an ARM in Turkey starting in 1970. The mortgage rate is based on a 1 percentage point spread over the bank discount rate. The pattern here is similar to that found in the case of the fixed rate mortgage: the share of payments in household income declines steadily and the real return to lenders is negative. The reason for this result rather than one which maintained the real value of the loan is that real interest rates in Turkey during most of this period were negative. Thus, although the adjustments to the interest rate covered some of the effects of inflation, there was substantial erosion of the real value of the loan (particularly in the mid-1970s when inflation exceeded the bank discount rate by more than 20 percentage points). Use of a different interest rate index that more accurately tracks inflation would significantly improve the performance of the ARM.

Table 6 shows a similar analysis for an ARM beginning in 1975. The results are the same: the real return to lenders is negative and the share of repayments in household income declines over the loan term. Although interest rates are modestly

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positive in the early 1980s, this is not nearly enough to offset the negative real interest rates recorded in the late 1970s and late 1980s.

The major difficulties associated with ARMs are the complexities of structuring the loan instrument to achieve a suitable balance of risk sharing and to correctly select the interest rate index. In particular:

- Shifting risk associated with expected inflation and the cost of funds makes the loan less
 attractive to borrowers and increases the possibility of default. Borrowers must be
 compensated for these factors by a lower interest rate, which makes borrowing slightly more
 affordable to households. However, the lower rate reduces the yield of the loan and lowers
 the gain to lenders of being relieved of some risk.
- As with the PLAM, when interest rate increases raise payments faster than incomes, households have to devote a larger share of household income to servicing the mortgage. Higher than expected interest rates can greatly increase the likelihood of default.
- Not all interest rate indices will accurately track inflation and the real cost of funds. As can
 be seen in the illustrated Turkish case, using the bank discount rate as an index failed to protect
 the lenders against future inflation.

Dual Index Mortgage

The final instrument to be considered—the dual index mortgage (DIM)— attempts to overcome the tilt problem and to distribute risks more satisfactorily between borrowers and lenders by relating the loan's payments and outstanding balance to an appropriate index which addresses the key concerns of each party. The payments are indexed to some measure of income in order to maintain the affordability of the loan to the household. The nominal balance of the loan is indexed to a measure of inflation in order to protect the real value of the lender's asset.

In circumstances where real wages are falling, households would not be required to make the full payment of principal and interest due; the unpaid portion is capitalized into the outstanding balance. Because the real rate of repayment can vary, the loan term must also be variable to accommodate shortfalls in real repayments when real wages are falling and accelerated real repayments when real wages are rising. Thus, the key question in designing the DIM is establishing the initial loan maturity schedule so that sufficient maturity extension can be accommodated to deal with possible shortfalls in real repayments. For example, the mortgage could be structured so that in the absence of any real wage changes the loan would

fully amortize in 15 years, but the contracted term of the mortgage would allow for an additional 5 years of repayments to cover any losses stemming from shortfalls in real repayments.⁷

Once the target amortization period has been decided, the payment schedule is determined based on the loan's (real) interest rate. At the end of the first year (or more frequently if inflation is high), the nominal value of the payment is adjusted by the change in the wage index and the nominal value of the outstanding balance is adjusted by the price index. This procedure is repeated at the end of each adjustment period. DIMs have been less widely adopted than ARMs or PLAMs. Mexico has employed a DIM for several years; Turkey has begun using the instrument; and Poland and Hungary are reportedly adopting it.

Table 7 shows the repayment schedule for a DIM in Turkey beginning in 1970. The initial payment is calculated based on a 15 year amortization schedule. However, because real wages grew rapidly in the 1970s, the indexation of the payment schedule to wages meant that the real value of the payments increased over time. This allowed the loan to be fully amortized in only 10 years.

DIMs can be structured so that they are open-ended (i.e., they have no fixed term), but these will not be attractive to borrowers since they face the prospects of extremely long payment schedules. In practice, the lender or some third party must assume the risk from outstanding balances at the end of the loan term.

Table 8 shows the repayment schedule for a 15-year DIM in Turkey that was originated in 1976. Because the trend in real wages in the 1980s has been negative, the real rate of repayment is slower than the 15 years projected by the amortization schedule. Thus, at the end of 1991, about 28 percent of the loan (in real terms) remains to be paid. If a five-year term extension were allowed, then the loan would be fully amortized, the final payment coming in 1995. (However, the extension period required would have been onger if not for the very large growth in real wages in 1989-1990.) Allowing for an adequate extension period beyond the projected term of the loan is important to the success of the DIM—but too long a term makes the loan less attractive to borrowers.

Some other features of the DIM can be seen in the tables:

- Although the real balance of the mortgage declines continuously through the term, in nominal
 terms the outstanding balance increases significantly until the last years of repayment. Like
 the PLAM, this implies lenders must have sources of finance to cover this expansion.
- Because of the link to nominal wage movements, the share of income devoted to servicing the
 mortgage debt is constant through the term of the loan (except in the final period when the
 residual balance is paid off).
- Whatever the term of the loan, the price indexation of the principal ensures that the lender's real rate of return is protected if the loan is fully amortized.

Key Factors in Other Country Experience

As the theoretical discussion and simulations above indicate, it is by no means certain that indexation and risk sharing are automatic solutions to the problems of housing finance affordability. In comparing alternative instruments in the Turkish historical context, the trade-offs associated with the different loans emerged clearly:

- In the case of fixed rate mortgages, households can borrow a smaller amount and require a capital subsidy to match levels of borrowing possible under the DIM and PLAM.
- ARMs have similar borrowing limitations as fixed rate mortgages, but also some risk of default if interest rates rise.
- PLAMs allow higher level of borrowing, but have a higher default risk when real wages are falling.
- DIMs allow higher level of borrowing and protect against default risk, but have potential costs for refinancing and at end of term.

The country cases studies which follow (see Table 9 for a summary of the main characteristics or
these cases) show that the usefulness and sustainability of housing finance systems based on alternative
mortgage instruments depend not only on the loan products used, but also on the correct set of supporting
actions and policies by government and financial institutions. This section outlines the key policies that
are

required to give the best chance for successful use of alternative mortgage instruments:

- The public sector plays a strong role in mobilizing funds for housing finance.
- Government carries a large share of the repayment risk associated with unforeseen changes in economic conditions.
- Economic policy must be consistent and credible to attract private participants.
- The system of indexation cannot be constantly adjusted to provide relief without eventually destabilizing the system.

Mobilization of Funds

There is a necessary role for government to play as a "guaranteeing" source of finance—mainly to provide financing for capitalized balances under the PLAM or DIM systems if private sources of liquidity dry up. In all of the cases examined, the government either acts as a primary source of financing or was required to step in to provide liquidity to the system. (It should be noted, however, that this intervention was often required because of other policy decisions that destabilized the system. This is discussed in greater detail below.) In Mexico, the national housing trust fund is used to cover refinancing costs of interest capitalization (with consequent reduction in new originations). The success of this funding arrangement and the stability given to the housing finance system by this commitment has encouraged commercial banks to develop their own methods for financing their interest capitalization costs.

Government Assumption of Risk

With all of the housing finance systems where the future path of repayments is not known with certainty there is the possibility that economic conditions will be such that large losses could be inflicted on lenders or borrowers. The lack of limitation on such risk can severely reduce the attractiveness of housing finance. In Mexico, end-of-term assumption of outstanding balance appeared to be a key factor for both banks and their depositors (who want the confidence of knowing when their commitment ends) and borrowers (who do not want to be carrying debt which could be passed on for generations—at least in theory). Similarly, in no case below (except Colombia) do private investors (either banks as lenders or depositors as sources of financing) will bear all risk associated with long-term lending for housing.

In using an alternative mortgage instrument such as a PLAM or a DIM, the government trades a contingent liability in the future (over which it has influence in terms of the effects of monetary and fiscal

policy) for current certain subsidies being paid for housing. (These current subsidies can be very large (when implicit subsidies are measured) and very inefficient. This is especially true where subsidized interest loans—which tend to have very high rates of subsidization but are limited to a few households—are still being made.⁸) Although the potential cost of assuming future risks may be high, it can be balanced by reducing current inefficient subsidies.

Explicit assumption of refinancing and end-of-term liabilities by government implies the need to face questions about how these liabilities will be financed: out of government current revenues (which could be hit by budget crunch at the time of greatest need) or through "housing trust fund" (which might be like the US Social Security Trust Fund where the surplus exists only on paper). Most countries have relied on current funds or Central Bank intervention.

Economic Policy

In all of the cases, the perception of government pursuing a credible economic stabilization and restructuring program was key factor in the success of the use of the alternative mortgage instrument. The Colombian and Mexican systems have worked to date because the governments appear committed to keeping inflation under control. The Brazilian and Chilean systems failed when inflation rates rose and depositors no longer believed that the real value of their funds would be maintained.

The Mexican case has attractive features which show how the government acknowledged the link between economic policy and housing finance policy:

- Use of the minimum wage index for payments means government must recognize effects of letting real wages drop (increased capitalization of interest) or rise (faster payoff of loans but also the possibility of increased inflation).
- Use of present value formula for the outstanding balance implies the variation in the real cost
 of funds can be built into the repayment schedule. Thus, tighter monetary policy (through
 which can raise real interest rates) implies greater end-of-term liability for the government as
 real repayments are slowed.

Indexation Structure

The case of Argentina in the 1980s illustrates this point. The Argentine housing fund (FONAVI), financed by a tax on wages, granted below-market mortgage loans. World Bank staff (Buckley, 1988) estimate that the rate of subsidy per unit in 1980-1986 was 90 percent of the cost of the unit. Because of this high rate of subsidy, FONAVI was able to make only 30,000 loans annually while its waiting lists swelled to over one million households.

The cases below show that the details of indexation are crucial to the successful use of alternative mortgage instruments, especially in high inflation environments where even indexation has difficulty in protecting the real value of assets. Small inconsistencies in the selection of indices or the timing of index adjustments used for assets and liabilities will be magnified as inflation rates increase and soon undermine the stability of the system.

These problems are often created by governments which seek to provide relief to borrowers who are being hard pressed by falling real wages. This was exactly the case in Israel in the 1960s, where inflation adjustments were moved from the price index to the cost-of-living index (a wage adjustment index) to a fixed inflation premium in response to political pressure from households. The acceleration of inflation in the 1970s caused the subsidy required from government to grow enormously, severely limiting the availability of housing finance and forcing a return to full indexation in 1979.

Country Case Studies

Mexico

Mexico in the 1980s was facing an increasingly difficult housing situation. Urbanization was continuing to increase (beyond two-thirds of the population in 1990) as was the total housing deficit; the deficit rose from an estimated 4.5 million units in 1980 to almost 6.0 million units in 1990 (Ball and Zearly, 1991). Demand for new housing has mainly been concentrated in the low-income end of the market, but this segment of the market has traditionally been unable to obtain formal housing finance. Only half of total annual housing construction has been financed through credit from the housing finance system. The remainder must rely on informal systems of production and finance.

Mexico has three main sources of formal housing finance (Montero, 1988):

- Commercial banks' lending is supplemented by resources and guarantees from FOVI (El Fondo de Operacion y Descuento Bancario a la Vivienda) and FOGA (El Fondo de Garantia y Apoyo a los Creditos para la Vivienda de Interes Social), respectively. These funds are Central Bank trust funds used to finance moderate- and low-income housing built by private contractors. Rights to financing are auctioned to homebuilders and banks.
- Housing programs for workers run through quasi-public pension funds. Both the funds for public sector employees (FOVISSTE—Fondo de la Vivienda del Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado de Mexico) and private sector employees (INFONAVIT—El Instituto del Fondo Nacional de la Vivienda para los Trabajadores de

Mexico) are financed through contributions by employers equal to 5 percent of basic salaries and wages.

 Public housing agencies, the most important of which is the government's low-income housing fund FONHAPO (El Fideicomiso de Habitaciones Populares de Mexico). FONHAPO is a revolving fund financed by contributions from the central government budget and is mandated to provide housing finance to households with incomes less than 2.5 times the minimum wage.

The period 1982-1988 saw an economic crisis, characterized by low growth, high levels of inflation, and falling real wages. The impact on the housing finance system was tremendous. Prior to 1982, Mexico had pursued a policy of mandating that 3 percent of banks' deposits be directed to fixed rate mortgages. While inflation was low, this policy had relatively small costs and appeared to be sustainable. However, in 1982 the inflation rose to over 100 percent while mortgage loan rates remained fixed at 14 percent and lower. Needless to say, the large negative costs to the banks of carrying these loans with negative real interest rates caused the banks (which had just been nationalized) to incur major losses. On the other hand, simply raising interest rates on mortgages to levels sufficient to cover the costs of inflation would make housing unaffordable to all but those households with the highest income levels.

The response of the Mexican central bankers was to develop an alternative mortgage instrument based on the standard DIM. However, experience in other Latin American countries with indexation and escalating inflation (whereby indexation created inflationary expectations and made it difficult to bring inflation under control) indicated that some other approach to maintaining the real value of the loan portfolio was required (Ball and Zearly, 1991).

Rather than linking the mortgage balance and payments to the indices for prices and wages, the Mexican system uses a weighted average of nominal interest rates to calculate payments due. The formula employed is

$$P_t = P_0 (1+r_1)(1+r_2)...(1+r_t)$$

where P_t is the payment due in period t, P_0 is the amount required to pay off the loan over a fixed term (usually 15 years), and r_1 , $r_2...r_t$ are the interest rate on term funds in each relevant period. The result is that each payment has a constant present value—the real value of payments is maintained.

On the affordability side, payments were indexed to movements in the minimum wage as set by the Mexican government (on a semi-annual basis). The minimum wage standard was taken as a proxy for household incomes over a survey-based statistical wage index because the Central Bank felt the monthly survey of wages was not consistently accurate—results were easily thrown off by changes in the response rate, demand for overtime, or payment of bonuses. Thus, the formula for calculating the actual payment due is

$$P_{t}^{*} = P_{0} (1+w_{1})(1+w_{2})...(1+w_{t})$$

where P_t^* is the actual payment due in period t, P_0 is the original base payment, and w_1 , $w_2...w_t$ are the changes in the minimum wage each period.

Where $P_t > P_t^*$, the difference was capitalized and the implicit term of the mortgage extended. Initially, the amount of interest which could be capitalized was limited to 70 percent of the original loan amount. However, with consistently high inflation in the 1980s, this cap was raised to 200 percent and then 500 percent before being abolished. A concurrent change with the removal of the capitalization caps was the imposition of a maximum 25 year term on the loan.¹⁰ At the end of the maximum term, the government covers any remaining balance (Maydon Garza, 1988).

The "FOVI System"—so-called to avoid the use of the word"indexed"—was introduced in 1984 and was required for all loans using FOVI funds and for those loans which were made to meet the mandated share of lending for housing. The new loans were immediately successful and within a year commercial banks were using the instrument in their own portfolios. In 1990, following the end of mandatory portfolio requirements in 1988, commercial banks lent over 8 percent of their deposit base for housing—higher than the 6 percent which had been previously required by the government. All commercial banks now employ some variant of the "FOVI System" and the instrument is being continually adapted by the banks to match their own portfolios.

Ghana¹¹

The system described below is that employed by FOVI. FONHAPO uses a similar system (see Maydon Garza, 1988), but it is indexed solely to changes in the minimum wage and so does not protect the real value of the outstanding principal when real wages are declining.

Previously, the loan was effectively open-ended, with the term being extended for as long as was required to pay off the outstanding balance. The possibility of payments stretching out for very long periods made the loan much less attractive to borrowers.

The following description is based mainly on World Bank (1990) and interviews with Bank project staff.

Since the 1970s, Ghana has experienced high rates of urbanization and cities have begun to play a dominant role in the economy; urban areas account for over 30 percent of the population and produce more than half of GDP. Under the country's current structural adjustment program, it is expected that urban growth will continue and the role of urban centers in the economy become even more important.

The difficulties caused by the poor performance of housing sector (even when measured against other sub-Saharan countries) are potential roadblocks to continued economic restructuring. The current stock of 1.4 million units requires between 54,000 and 74,000 units of new construction per year to meet projected population growth through 2000. This is a huge increase over current levels of production—about 2,000 units from the formal sector and 25,000 units from the informal sector. This low level of production—which helps to drive the ratio of new house prices to income to more than 12 times annual income—is mainly an outcome of structural problems in the sector and its solution will require a long-term approach.

In the short term, the current housing system presents serious financing problems for households and is marked by large subsidies being spent inefficiently.¹² These problems include the almost complete absence of long-term financing for housing, high interest rates (about 26 to 30 percent annually), and high-cost building methods. The money and capital markets of the country have suffered from past credit policies which kept interest rates negative in real terms (driving away depositors and not allowing the banks to price their loans for risk and maturity). Investors looking for long-term investments were compelled to purchase government securities (a practice which has been stopped). What little long-term financing which was being made available came from the SSNIT (Social Security and National Insurance Trust). However, the SSNIT's policy of lending for high-cost housing at highly subsidized interest rates has significant costs to the trust and could eventually lead to its decapitalization if the policy were continued and expanded.

In this context, the Government of Ghana (GOG) and the World Bank have undertaken the implementation of a long-term strategy for the housing sector. The components of the strategy include:

• Reduce the role of government in the housing sector.

The World Bank estimates that housing parastatals (some of which are bankrupt) control assets worth over 2 percent of GDP and that the value of housing subsidies received by some government employees is several times higher than their salaries.

- Develop a sustainable system of mortgage finance to fund the new providers who will take over from government.
- Make housing subsidies better targeted and more transparent.
- Reform building codes and land use regulations so that they are simpler, more affordable, and encourage greater private production of inputs.
- Resolve problems associated with receiving clear title for land.
- Change foreclosure laws to ensure adequate security for banks.

The first component of this strategy is a housing finance pilot project. The project will attempt to establish an indexed housing finance system that would provide affordable loans while also yield an acceptable return to investors. The project will finance 2,000 new housing units (out of total annual production of about 70,000 units) built and marketed by private developers. The project will also finance the sale of an additional 1,000 government-owned units to private sector owners.

Financing for the project will be provided through the sale of long-term mortgage-backed bonds with a term of 30 years (but allowance for early repayment). The bonds will be sold to the SSNIT and GOG by the Home Finance Company (HFC), a subsidiary of the Merchant Bank of Ghana (MBG), a government-controlled bank. The bonds will pay interest monthly at a rate of 1 percent annually on the outstanding balance, which will be fully adjusted for inflation as measured by the Consumer Price Index (CPI). Although the rate appears low, it is actually high for the Ghanaian economy, where bank deposits and government bonds have typically yielded negative real returns. There are no other competing long-term instruments which offer such a certain return. As a result, the bonds are highly attractive to the SSNIT.

Loans under the system will be structured as DIMs and will be made by approved financial institutions (such as commercial and cooperative banks). At the beginning of each month, the outstanding balance of the loan will be adjusted by the average change in the CPI for the latest three months for which data is available. Monthly payments by borrowers will be fixed at 25 percent of the gross salaries (i.e., including bonuses and before taxes and other deductions) of the husband and wife of the household. Borrowers will be required to sign a power-of-attorney which authorizes mortgage payments to be made

by salary deduction at source.¹³ Payments will be adjusted each time salaries are changed (usually semi-annually). In cases where one or both of the loan recipients loses their job, alternative collection methods will be employed and it is also anticipated that forbearance procedures (up to a maximum of six months) will be developed to cover cases of complete loss of employment by the household.

Loan-to-value ratios for most borrowers will be below 80 percent; a 20 percent downpayment is quite standard in Ghana (even as an up-front payment for self-construction). The design term of the loan (for underwriting purposes) will be 20 years. However, if payments do not keep up with inflation, the term of the loan will increase as interest is capitalized. If the loan still has an outstanding balance at the end of 30 years, the loss on the balance will be covered by the GOG in the form of payments foregone on its outstanding bonds from HFC. The actual interest rate on the loan will be in the range of 2.5 to 3.5 percent (which is composed of 1.0 percent for the HFC bonds, 0.5 percent for HFC operations, and 1.0 to 2.0 percentage points for servicing costs of the originating institution).

With such a low rate, the risk of the loan term extending beyond 30 years is relatively small, requiring inflation rates to remain above 30 percent annually and for real wages to decline by more than 1 percent annually. Despite the low rate, the project's loans will not be affordable to households below the fortieth percentile of the income distribution, as reaching this income level would require direct subsidies which are not possible in the current budgetary situation.

Brazil

Brazil has had the most comprehensive use of indexation of the countries we are examining: in 1964 indexation was introduced into bond issues, savings accounts (in the housing finance system), mortgages, rents, inventory valuation and tax liabilities. Also wages and exchange rates were indexed, but here there is larger scope for discretionary changes, and a weaker link to the price index.

The Housing Financial System (SFH) was to be administered by the National Housing Bank (BHN) specially created with the mandate to encourage housing construction and ownership, especially by lower-income families (Pasternak Taschner and Sachs, 1990).

The principal sources of funds for housing were savings and housing finance notes (bonds that are totally guaranteed with a minimum maturity date of one year and interest rates of 6 percent plus monetary

Note that this process only allows access to the loan instrument to those who hold salaried, formal sector jobs. Once enforceable foreclosure procedures are developed, extension of the system to non-salaried households is expected.

correction.) When the system was instituted it was established that the balances of the asset and liability operations should be corrected on the same date and in the same time period (every quarter).

Savings came from two principal sources. Compulsory savings collected through payroll and managed by BHN (through the FGTS), yielding quarterly interest and inflationary correction could only be reclaimed when employees left the company, got married, bought a business or bought property from the SFH. Voluntary savings yielded 6.14 percent interest per year and monthly inflationary correction and were fully liquid. Voluntary savings are deposited in the Brazilian System for Savings and Loans, comprising both private for-profit and public corporations. Voluntary savings increased as a share of total savings from 3.8 percent in 1967 to 49.6 percent in 1973 and 62.1 percent in 1984. Loans funded by the cheaper, longer term compulsory savings were available on more favorable terms than those funded by the voluntary savings, so this change in composition made housing finance less accessible to the low-income population (Pasternak Taschner and Sachs, 1990).

All borrowers paid monetary correction on their loans. Initially the correction was based on the same index used for government bonds, the wholesale price index; and both installments and balance were adjusted quarterly as were savings deposits. However, arising from complaints that wages were not rising as fast as prices, the mortgage installments of all but high income borrowers were changed to an adjustment based on increases in minimum wage or on an occupational category collective-bargaining agreement. The debtor balance continued to be adjusted quarterly. The switch to wage indexation meant that not only were different indices used for assets and liabilities, but also because salaries are adjusted annually the adjustment periods were different. The asymmetry between savers and borrowers was addressed with variations in the length of the mortgage contract and the creation of the Fund for Compensation of Salary Variation (FCVS) which guaranteed the entire amortization after a maximum extension of 50 percent of the contracted term. However, when inflation outstripped salary increases, this put immense pressure on FCVS. This pressure was compounded by concessions to borrowers which reduced the real value of installments owed, subsidies whose effects were spread over the remainder of the loan term (Fernandes Franco, 1988). These pressures were among the severe difficulties that led to the system's financial crash in 1986.¹⁴

In 1983 the growing difference between the large upward correction of mortgage installments and the smaller salary (continued...)

The growth of building activity in the first decade of this system is impressive relative to the record before the introduction of indexing. (1,105,000 units financed in 1967-1974 compared with 100,000 in three previous decades.) However, in comparison with the growth of population and formation of new families, it appears less successful. Funds were still not adequate in view of population growth, urbanization and unsatisfied demand. Moreover, according to Batley (1988) the BNH did little for its original target group, the poor—the cost of land and houses as well as the financial terms of the system effectively excluded them.

Colombia

With a stagnant urban construction sector in the 1960s compared to average overall growth of the economy of about 5 percent per year and similar growth of urban population, the housing deficit in Colombia grew from 112,000 in 1951 to 254,000 in 1961 and 586,000 in 1971. In the 1960s consumer prices rose on average by 11 percent per year. The bonds issued for financing housing (by the two principal housing agencies, the Banco Central Hipotecario (BCH) and the Instituto de Crédito Territorial (ICT)) were not attractive after inflation; most were held by public institutions as forced savings—mostly ultimately funded by government subsidies. There is substantial evidence that there was large unsatisfied demand for housing loans in 1968-1971; for example, when the interest rate of BCH bonds was raised in 1968 there was a big upsurge in funds available to the BCH but an even larger increase in the growth of demand for these funds (Sandilands, 1980).

In 1971 the government adopted the "Plan of the Four Strategies" which was premised on the idea that the economy should be boosted through special treatment for two "leading" sectors: exports and construction. Because housing was constrained by lack of funds at a cost most people could afford,

^{(...}continued)

increase overburdened the Fund and increased the number of defaults. Starting in 1982, salaries were readjusted annually at indexes of 100 percent and BNH installments at a rate of 130 percent. Inflation in 1983 was 157 percent, reaching 215 percent in 1984. Concessions to borrowers (e.g., adjusting the annual installment by only 50 percent of the monetary correction, or 80 percent of the variation of minimum wage) resulted in a serious reduction of the real value of installments owed. A study undertaken in 1988 found that for 15-year contracts expiring in December 1986, the residual debt was 38.6 percent of the amount financed, and through simulations, found still worse results for contracts started later—for example, loans begun in 1978 would in 1993 have residues of 118.7 percent of the amount lent (Fernandes Franco, 1988). The system's funding base, savings deposits, were simultaneously being diminished: in 1981-1984 savings were withdrawn to supplement household budgets, FGTS funds were depleted by unemployment and the Cruzado Plan's artificial freezing of prices was followed by a consumption boom with 20 percent of savings withdrawn in 1986.

construction was to be encouraged by the development of a completely new indexed savings and loans system. This new system provided for the daily adjustment—to the cost of living—of the principal of both mortgages and savings, based on the rationale that borrowers would not mind having their mortgages adjusted upward if their properties and incomes were also rising in value, while savers require protection from erosion of purchasing power from inflation but at the same time wish to be assured of liquidity (Rosas, 1990).

The first Corporaciones de Ahorro y Vivienda (CAVs) began operation in September 1972 by issuing indexed savings certificates (Certificados de Ahorro) and completely liquid deposit accounts (Cuentas de Ahorro). Ten CAVs were authorized, a number thought to ensure competition while retaining the advantages of economies of scale. The new certificates and accounts were both denominated in a new unit of account know as "unidades de poder adquisitivo constante" (UPAC).

Borrowers and savers reacted quickly to the introduction of the new savings and loans instruments: within its first eighteen months the CAVs had already captured—from 60,000 depositors—7.0 billion Colombian pesos (about US\$300 million) and demand for loans far exceeded this sum.¹⁵ Starting in 1973 the private CAVs became the largest source of new resources used in construction, and by 1977 they were the largest providers of individual mortgage credit as well. In 1990 it was estimated that the system was financing some 70 percent of building construction from repayments and new deposits. When the UPAC system started in 1972, BCH quickly went from providing 81 percent of financing in 1971, to 65 percent in 1972, and 26 percent in 1973. Since then it has never provided more than 15 percent of housing finance in Colombia. The total number of housing units financed in Colombia rose from an average of 30,000 per year (1965-1972) to an average of 37,000 in 1973-1980 to 74,000 in 1981-1987 (Rosas, 1990). This was during a period when inflation remained consistently above 20 percent.

The current (1991) portfolio of the CAVs—700,000 loans—totals 1.71 trillion pesos, or US\$2.86 billion, of which 17.5 percent is in construction loans (with terms of less that 165 months) and the balance in long-term housing loans. Loans with doubtful repayment status make up 3 percent of the total portfolio

By the end of 1973 nearly 11.0 billion pesos had been requested in loans, about three times the accumulated deposits, or an excess demand of over 7.0 billion pesos.

(Bustamante, 1991).16

The popularity of CAV deposits along with changes in government policy resulted in an increase in interest rates on competing assets, reducing the burden of inflationary taxes on financial holdings and facilitating growth-enhancing investment. The percentage of family income, which averaged 1.3 percent during 1965-1971, rose to 5.9 percent during 1972-1978 (Carrizosa et al., 1982). Financial savings as a share of GDP increased from 6.1 percent in 1970 to 17 percent in 1982 (Pachon, 1983).

Daily adjustments—currently made to both outstanding loan principal amounts and savings balances—are calculated as 45 percent of the change in the consumer price index for the preceding twelve months plus 35 percent of the DTF, an average of the interest rates used by other financial intermediaries, for the previous month. At the inception of the system, the principle of monetary correction was to follow the movements of the price level closely, but in 1974 a ceiling was placed on monetary correction to protect the borrowers; it remained in place for seventeen years, creating a substantial divergence between the UPAC index and actual inflation, and thus reducing the intended effect of the indexation. The ceiling on monetary correction was eliminated in May 1991.

An interest rate component was introduced into the adjustment starting in 1984 when rates on time deposits in commercial banks rose in relation to inflation, pushing real interest rates up significantly (Currie and Rosas, 1986).¹⁷ A link to rates of interest had been considered when the system was being designed, but was rejected at that time because of the lack of a suitable benchmark rate, the high variability of rates (Currie, 1986), and the likelihood that variable interest rates would place too high a debt service burden on households in the early years of the loan term under inflationary conditions (Rosas, 1990).

In a country where ordinary bank losses have been very large, one indicator of the success of the UPAC system is the absence of losses borne by depositors since the beginning of the system. Savings accounts are completely liquid: withdrawal can be made at any time with no notice. A 1986 study found

A comparable figure for commercial banks in Colombia is 15.3 percent, and the record is worse for other financial intermediaries (Rosas, 1990).

In 1984, both the rates of inflation and of the monetary correction fluctuated around 16 percent annually. At the same time, the interest rates offered by other financial intermediaries were around 38 percent. Because the CAVs were unable to compete, a financial component was introduced into the monetary correction formula. The formula became the CPI plus 0.015 of the square of the difference between the change in the CPI and the return on banks' certificates of deposit (Bustamante, 1991).

that CAV deposits became close substitutes for currency, a vehicle for avoiding the inflation tax (cited in Buckley and Dokeniya, 1989). For UPAC deposits CAVs were initially to offer a real return of 5 percent with monetary correction, as opposed to a nominal return of 19 percent for ordinary deposits. Now, however, real interest rates can be freely set by the CAVs; the rates must be published at the beginning of each quarter in newspapers with a wide readership, and cannot be changed during the quarter. As a further incentive to depositors, the monetary correction was tax exempt (although this exemption was partially lifted during 1974-1991). This exemption is consistent with the idea that monetary correction, as a device to maintain the real value of the asset as opposed to being income, should not be subject to income tax, nor should the exemption be considered an implicit subsidy. The interest on savings was initially tax exempt, but the exemption was eliminated in 1974 (Sandilands, 1980). According to current law 60 percent of earned interest is now subject to tax (Bustamante, 1991).

Outstanding CAV assets are indexed daily in the same way as deposits. Both loans and repayment schedules are expressed in terms of UPACs and each monthly repayment varies in current peso terms according to the day on which the payment is made. Real borrowing rates were set initially at 8 percent for developers and 7.5 percent for final buyers. Current interest rates vary with the size of the loan (and whether the housing to be purchased is new or used) from 5 percent to 10.5 percent for housing valued up to 4,000 UPAC (approximately US \$22,500);¹⁸ for larger loans, borrowing rates can be freely set between the CAVs and the borrowers. The rate differentiation was justified by the intention of cross-subsidizing low income buyers and by the explanation that the differential compensates for the implicit subsidy of the income tax deduction for interest payments (i.e. borrowers of larger amounts get larger deductions). However, Pachon (1983) showed that the tax subsidy—although interest paid has only been partially deductible since 1979—more than outweighs the interest subsidies set in the early 1980s, so that the total subsidy was regressive.

Four different kinds of amortization schedule are available to final buyers: gradual amortization (i.e., level total payments with rising principal payments all expressed in real, or UPAC, terms) and constant, declining, or increasing amortization. The monthly payment cannot exceed 40 percent of the average monthly income of the borrower at time of loan application. Most mortgage contracts are based

One UPAC, which was equal to 100 pesos in 1972, will be equal to 3,370 pesos or US\$5.62 as of July 1991, reflecting the UPAC monetary correction since then.

on the constant amortization schedule, which involves declining monthly carrying costs as a share of total payments in real or UPAC terms. Typical loans have a loan-to-value ratio of 70 percent and a term of 15 years. CAV borrowers have a high rate of loan prepayment, thus increasing the rotation of CAV funds and lowering the actual term even further. Special regulations require a certain percentage of lending for low income housing and set guidelines for the loan terms.

In the event of a sudden decrease in deposits, the CAVs can borrow from the Central Bank and in case of excess liquidity they can invest in a special Housing and Savings Fund (FAVI) set up in the Bank. Monetary authorities can use this special relationship to direct the amount of credit available to borrowers through manipulations of the conditions to the CAVs—for example, FAVI has made its conditions more onerous when it wants to contract credit—for example, at present investments in FAVI have been suspended in order to direct funds towards the market for government bonds (which are less liquid than FAVI holdings)—and has lowered the returns on FAVI titles to increase the supply of credit (Pachon, 1983).

Over the two decades the system has been in existence, varying government agendas and economic circumstances have led to changes in its characteristics and in the regulations governing the system.¹⁹ Efforts to stabilize the economy in 1974 and 1977, for example, included placing a cap on monetary correction, stricter reserve requirements and reduction in tax exemptions.²⁰ Later changes in the early

Since 1977 there have been various changes in policy alternately tightening control and easing restrictions. The upper limit on monetary correction remained until May of 1991, though it was raised incrementally at various points. Strict (continued...)

See Mark (1991) for the details of these regulatory interventions.

In August 1974, in response to rising inflation and criticisms of indexation, the expansion of the UPAC system was limited by increased reserve requirements and a 20 percent ceiling on the rate of indexation. In addition, the 1974 Tax Reform had the side effect of decreasing the after-tax return on savings. In particular, taxes were placed on saving account interest. The real interest rate on deposits was reduced and again interest was only payable on the minimum trimestral balance. Three other measures contributed to a recession in late 1974 and early 1975: an increase in CAV capital requirements; 15 percent reserve requirements on savings deposits and 10 percent on savings certificates to be placed in FAVI (treating CAVs as if they were commercial banks); and restricted ratio of loan approvals to disbursal of 1.2 to 1.

The general uncertainty caused by the political attacks on the system led to a slowdown and then sharp fall in real deposits. But when a recession in the building industry followed, some policies relating to CAV savings were changed and deposits again increased. Nevertheless the recession had forced CAVs to borrow heavily and in August 1975 loans from the Central Bank totalling \$697 million (in terms of September 1972 pesos) were still outstanding (Sandilands, 1980).

1980s were intended to redirect the UPAC system towards lower income housing—these measures included setting extended amortization terms and new lending quotas (Giraldo Isaza, 1987).²¹ Some observers argue that these departures from the principle of the system led to the less successful years of the system following its strong start in 1973-1974. It is clear that while the UPAC system has been successful overall, government intervention has had a strong effect on the UPAC system's relative effectiveness in dealing with the problems of inflation.

Chile²²

Chile has had long experience with monetary indexation, first instituting monetary correction in its housing finance system in 1959 after 19 years of annual inflation averaging around 27 percent. During the 1960s and 1970s the highly subsidized CORVI system—the state agency catering mainly to low-income borrowers—grew less rapidly than the private system and experienced high delinquency rates. In principle, the mortgage repayments were linked to a wage index, but a considerable discretionary element was superimposed so that, both for political reasons and to reduce the level of delinquency, full indexation was rarely applied for long. Although in theory open to everyone, CORVI savings accounts were in practice mainly tied to the intended purchase of a home because they did not earn interest or monetary correction unless left on deposit for three years or used for a house purchase.

Chile's Savings and Loan System (SINAP)—which was based on the US savings and loan model and catered to middle and upper income households—was started in 1960 and collapsed in 1975.

The system was completely indexed, initially on either the wages and salaries index or CPI, whichever rose less (usually CPI). However, the two-month lag in data availability caused considerable divergence from actual inflation which after 1972 was to the great disadvantage of savers and advantage of borrowers. Moreover, the fact that the adjustment was implemented only once a year created problems:

reserve requirements were enacted from 1977 to 1978 motivated by the sharp increase in the rate of inflation as foreign exchange earnings rose because of the coffee bonanza and the illegal export boom. Effective reductions in reserve requirements in 1982 and other liberalizing measures between 1978 and 1982 resulted in increases in real returns to depositors and ultimately resource mobilization (Pachon, 1983).

For example, the Betancur administration changed the credit allocation conditions in September of 1982 in order to increase the supply of low income housing, but had to change the limits again because little low income housing was financed by CAVs anyway, apparently because they were competing with subsidized housing.

^{(...}continued)

This section draws on extensively on Sandilands (1980) and Renaud (1988).

one was the necessity of undertaking discretionary adjustments; another the effect that savers made unusually large withdrawals after each annual adjustment at the end of June.²³

Real deposit rates were around 4 percent and mortgage lending rates around 7 percent. Loans were only made to persons holding savings accounts with one of the associations.²⁴ SINAP borrowers are given no tax exemptions for any part of their payment. On the liability side, the 21 AAPs (savings and loans associations) were selling readjustable housing bonds (VHRs) of short maturity and receiving momentary correction and 8 percent real interest, in addition to short-term deposits, both contractual and "free." Because deposit rates were kept low, bonds became an increasingly important source of funds. An attempt to extend the VHRs' maturity in order to improve the stability and liquidity of the system resulted in a sharp decrease in their sales.

The state-controlled Caja Central de Ahorro y Prestamo acted as a central bank or lender of last resort for the AAPs through purchase of mortgages held by the AAPs whenever they were faced by a temporary shortage of liquidity. The Caja Central also established interest rates and adjustment indices for AAP savings and loan operations.

Until 1972 the SINAP system was able to mobilize large amount of savings and financed more than half of the total market output. (Three mortgage banks and commercial banks were also operating in the market, but under different rules.) But while SINAP liabilities were relatively attractive, Chile was undergoing a major housing recession; this situation was closely followed by a recovery and large increases in SINAP lending in conjunction with sharp reductions in their deposits after financial liberalization. In combination with the hyperinflation Chile was experiencing, this quick succession of high liquidity and disintermediation led to the closing of SINAP in 1975.²⁵

In December of 1974 it was decided to start implementing adjustments quarterly, which somewhat reduced—but did not eliminate—the problems.

The Chilean system—both CORVI and SINAP—relied heavily on "tied savings." While that may be helpful with low-income borrowers who probably have low creditworthiness, a substantial downpayment requirement may in fact be a good enough test of reliability.

During 1970-1972 the return on SINAP savings instruments was good in comparison with other financial assets. Simultaneously, there was a very severe recession in the private housing market resulting in a large buildup of unutilized funds. The military regime in 1973 began to dismantle economic regulations and controls and rapidly liberalized the financial system which had been closely regulated and subjected to various forms of credit allocation. In 1974 SINAP increased its mortgage lending and a major recovery took place in the housing sector. Unfortunately, (continued...)

When SINAP ceased to function the government was faced with the collapse of the housing market. The new system is no longer served by specialized institutions distinct from the rest of the financial sector: it now operates through banks and an active primary and secondary bond market. An old mortgage bond instrument, the "letra hipotecaria," was revived and commercial banks were authorized to enter into the mortgage lending business. Mortgages could be financed by these letras which could either be sold on the stock market, or kept in portfolio. The new system was designed so as to avoid interest and liquidity risks which had crippled SINAP. Financial neutrality toward the housing system would be achieved because mortgage rates would be market-determined rather than administered by the government. These bonds were indexed to a financial index, the "Unidad de Fomento"—a monetary unit indexed to domestic inflation (using the CPI) and revalued daily on the basis of inflation rate of the previous month.

For low-income home-buyers a new subsidy system was put into place. The system of the last decade has targeted and transparent subsidies. Three elements cover the cost of buying a house: prior savings; a subsidy which is a direct one-time capital grant; and a mortgage loan carrying a market rate of interest. The amount of the mortgage is expected to have monthly payments of no more than 20 percent of expenditures. The public sector is only involved in providing the subsidy certificate.

In 1982-1983 the housing finance sector experienced massive stress like the rest of the financial markets. Real wages fell by about 25 percent, actual unemployment rose to 30 percent, real interest rates on mortgage bonds climbed to 23 percent, mortgage lending spreads widened to 4 percent and the value of houses as collateral declined sharply. The accompanying economic depression included a collapse of the housing market. The Central Bank was forced to intervene massively in the financial system, including the mortgage market. These implicit subsidies have been much larger than the budgeted subsidy certificates and have benefitted the upper income groups and moreover contributed to higher inflation which is still being felt.

A remaining problem in Chile is the high cost of housing finance and the need for better mortgage design for high and middle income borrowers.

^{(...}continued)

the disbursement of SINAP's accumulated liquidities could not be matched by an equivalent inflow of new funds because of the liberalization of interest rates. Moreover, in the newly liberalized capital market, the scarcity of funds created very high *real* interest rates, against which indexation was unable to protect the lenders. SINAP had to pay higher and higher rates in order to maintain existing deposits and finally closed in June 1975.

The SINAP experience showed that indexing can be very effective in increasing the volume of funds available for housing. SINAP was almost completely unsubsidized (e.g., savers were given no tax allowances); and despite high real interest rates there were always enough creditworthy borrowers except during the housing recession of 1971-1973. In addition, delinquency in the private system was very low. However, the hyperinflation after 1972 placed too great a pressure on a system with several flaws, including the problems created by the infrequency of the adjustment procedure and the inability of indexation to protect the lender from changes in the real interest rate.

Israel²⁶

The housing finance system in Israel has utilized indexed mortgages in response to high inflation in two periods, 1956-1970 and from 1979 to the present. In both of these periods, accelerating rates of inflation required that loans be directly linked to inflation in order to be matched with the liabilities lending institutions had to offer to maintain the flow of resources to the financial sector. The initial abandonment of mortgage indexation in the 1970s does not so much reflect the failure of the principle of indexation, but rather highlights some of the key implementation issues which need to be addressed in order for indexation to be successful; the resumption of indexed lending in 1979 supports this view.

A combination of rising inflation and legal ceilings on interest rates in the early 1950s led to a shortage of capital for housing. Initially, housing finance institutions (mainly mortgage banks, the largest of which were subsidiaries of the commercial banks) responded through the use of loans and matching liabilities linked to the US dollar. However, the 66 percent devaluation of the Israeli currency in 1962 forced the conversion of most dollar-linked mortgages to PLAMs indexed to the CPI. (Losses to the lending institutions resulting from this conversion were covered out of the government budget.)

PLAMs issued by private lenders carried an interest rate of 8 percent, with a term of 10 to 15 years. Loan-to-value ratios were low, typically only 40 percent. Adjustments based on the CPI were (initially) made on a monthly basis. These loans were mainly funded through the issuance of indexed bonds with terms of 10 to 17 years and by deposits placed in the mortgage bank by the parent commercial bank. These bonds and deposits received favorable tax treatment, with no tax being due on principal adjustments and reduced levels of tax on interest earnings. Mortgages extended using government

This section is based primarily on Cukierman (1975) except as noted.

resources carried more preferential terms, with a rate of 3 to 8 percent and a term of 15 to 30 years. In some cases, only a portion of the loan was indexed. These funds, provided through the government budget or through the sale of government bonds, were channeled through the mortgage banks. In the 1960s, these government deposits accounted for 44 percent (on average) of the mortgage banks' liabilities, ranging from 67 percent in 1960 to 35 percent in 1969.

The use of PLAMs soon became problematic as price rises in this period (1963-1965) were outstripping wage increases. As households faced increasing difficulty in making their payments, pressure soon mounted for a slowing in the pace of adjustment, so that changes in payments began to lag behind changes in the CPI.

In 1965, a government commission recommended that the reference index be switched from the CPI to the cost of living allowance (COLA). The COLA index was linked to the CPI, but was adjusted only once or twice annually and only if the CPI had increased by more than 5 percent since the last COLA adjustment. This change was meant to improve the synchronization between the adjustment of wages and mortgage payments while still maintaining the link to the price level. This change was adopted in 1966 for all new mortgages.

This change had little impact, though, as inflation had been brought under control, with the annual rise in the CPI brought below 4 percent by 1967. In the face of popular resistance to indexation (which was seen by households as unfairly requiring them to bear most of the inflation risk) and lower inflation, the government quickly responded to the demand to replace PLAMs with mortgages unlinked to the CPI. These unlinked mortgages carried a fixed inflation premium of 3-4 percent annually above their interest rate. Most households took up this option and the outstanding balance of PLAMs was reduced to practically zero. This change shifted the inflation risk back to the lending institutions. The institutions, in turn, because they continued to finance these mortgages with indexed liabilities, passed the risk on to government which covered the difference between the cost of indexed borrowing and the return on the fixed-premium mortgages. In 1967-1970, when inflation remained below 4 percent, these costs were negligible. However, with the increasing inflation of the 1970s (reaching 76 percent annually in 1979), the amount of unindexed lending was severely restricted by limits on the amount of subsidy government could pay.

Indexed mortgages remained available during the 1970s, but were not in much demand because

of their unattractiveness compared to the (limited) fixed rate financing which could be obtained. However, by the end of the 1970s the inflation rate exceeded 60 percent annually and indexation of mortgages (in the form of a PLAM) was reimposed in July 1979. Adjustments were initially made semi-annually; from November 1981, adjustments were made on a quarterly basis (Bar-Nathan, 1988).

The move back to indexation initially widened the differences between public and private mortgages. Public mortgages remained essentially the same, with interest rate of 5 percent, a term of 25 years, a loan-to-value ratio of up to 50 percent, and only partial indexation. These mortgages were allocated on the basis of need, using income and household size as the main criteria. However, private finance contracted: interest rates rose (to as high as 13 percent); terms shortened (to a maximum of 10 years); and loan-to-value ratios plummeted (to 10 percent).

Since 1985, with the lifting of restrictions on mortgage banks (mainly ceilings on the volume of lending), this picture has improved. Interest rates have fallen to 5 percent in 1990 and mortgage banks have returned to the bond market to raise funds for mortgage lending (Nanita-Kennet and Miller, 1990). Mortgage banks are also lengthening the terms of their loans and some trading in a secondary mortgage market is developing (Carmon and Czamanski, 1990).

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